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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,833	06/23/2005	Hiroyuki Sato	10936-87	2138

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PORTER WRIGHT MORRIS & ARTHUR, LLP  
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COLUMBUS, OH 43215

EXAMINER
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LOEWE, ROBERT S

ART UNIT	PAPER NUMBER
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1796

MAIL DATE	DELIVERY MODE
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05/15/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,833	<b>Applicant(s)</b> SATO ET AL.	
	<b>Examiner</b> ROBERT LOEWE	<b>Art Unit</b> 1796	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 May 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 3,5,7 and 10-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3,5,7 and 10-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3/13/09</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/4/09 has been entered.

### ***Response to Arguments***

At the outset, the Examiner would like to apologize for the belief that Applicants amendments regarding the process claims would remove the previously relied upon prior art rejections of Miyahara et al. (US Pat. 5,840,830) and Sato et al. (JP-2000-191785). Upon further consideration of these references, it is believed that Miyahara et al. can still be relied upon as prior art for both product and process claims.

Applicants argue that the claimed invention comprises four important process steps, which, in combination, provide a poly(arylene sulfide) (PAS) having the combination of improved physical properties as claimed. The claimed dehydration step (1) has an organic amide solvent, and an aqueous mixture of alkali metal hydrosulfide and alkali metal hydroxide such that there are from 0.95 to 1.05 moles of alkali metal hydrosulfide per mole of alkali metal hydroxide which is collectively heated and reacted. While Miyahara et al. exemplifies the use of sodium sulfide as a starting material, Miyahara et al. explicitly suggests that the sodium sulfide may be prepared in situ by the reaction of an almost equimolar amount of alkali metal

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hydrosulfide and alkali metal hydroxide. The reaction between an alkali metal hydrosulfide and an alkali metal hydroxide inherently produces the alkali metal sulfide and water. Therefore, during the course of heating and reacting (i.e., the dehydration step (1) of instant claim 5), water will be produced. As a result, the alkali metal hydrosulfide and alkali metal hydroxide will be present as an aqueous mixture with water.

Applicants further claim in step (1) of instant claim 5 that at least a portion of the distillate is discharged from the interior of the system to the exterior of the system. Miyahara et al. explicitly teaches that water or the azeotropic mixture of water and the organic amide solvent is discharged **out of the system** along with hydrogen sulfide (7:44-48). While Miyahara et al. further teaches recovery and reuse of the hydrogen sulfide, Miyahara et al. nevertheless clearly satisfies this limitation of instant claim 5. There is simply nothing claimed which excludes the recovery and reuse step of the hydrogen sulfide produced in the dehydration step of Miyahara et al. Miyahara et al. explicitly teaches discharging at least part of the distillate from the interior of the system to the exterior of the system (7:44-48). Therefore, Applicants arguments regarding this point are not found to be persuasive.

Applicants argue that Miyahara et al. does not exemplify the claimed dehydration step wherein the alkali metal sulfide is prepared in situ by reaction of an alkali metal hydrosulfide and an alkali metal hydroxide. However, Miyahara et al. clearly and explicitly teaches that this step is possible. A reference may be relied upon for all that it teaches, including non-preferred embodiments.

Given the teachings of Miyahara et al., the only difference between what Miyahara et al. exemplifies and what Applicants claim appears to be the fact that Miyahara et al. do not prepare

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sodium sulfide in situ according to the working examples. However, Miyahara et al. explicitly teaches that the in situ preparation of sodium sulfide is possible. This appears to be the only limitation which is not exemplified by Miyahara et al., however, such a limitation is anticipated by Miyahara et al. since substitution of the in situ preparation of sodium sulfide as suggested by Miyahara et al. into the examples therein, results in the same claimed process steps, and thus, the same claimed material. The fact that Applicants believe to have discovered an improved poly(arylene sulfide) is not cause for patentability when such a material is believed to be anticipated by the prior art.

Because Sato et al. and Miyahara et al. are substantially similar in scope and teachings, and because Miyahara et al. is relied upon as a 102(b) reference while Sato et al. was relied upon as a 103(a) reference, the Sato et al. rejection is withdrawn. Specifically, Miyahara et al. is believed to be the stronger of the two rejections and should Applicants overcome the Miyahara et al. rejection to Miyahara et al., the Sato et al. rejection would also be removed, due to its substantial similarity to Miyahara et al.

### ***Claim Objections***

Claim 5 is objected to. The newly added limitations at the end of process step (1), specifically the limitation "and wherein the proportion...of the alkali metal hydrosulfide" is believed to be redundant, since the mol ratio between the alkali metal hydroxide to alkali metal hydrosulfide is already claimed in process step (1) of instant claim 5.

***Claim Rejections - 35 USC § 102***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 3, 5, 7 and 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyahara et al. (US Pat. 5,840,830).

Claim 5: Miyahara et al. teaches a process for producing a poly(arylene sulfide) by polymerizing a sulfur source and a dihalo-aromatic compound in an organic amide solvent. Miyahara et al. first teaches a dehydration step whereby sodium sulfide and NMP are subjected to distillation, removing a part of the distillate containing water (10:55-67). While Miyahara et al. employs sodium sulfide pentahydrate as the starting material in the working examples, Miyahara et al. does explicitly teach that the sodium sulfide can be produced in situ by reaction of sodium hydrosulfide and sodium hydroxide (4:61-64) "in an almost equimolar amount" (6:49-53). The teaching "in an almost equimolar amount" would certainly suggest to a person having ordinary skill in the art to be within the claimed mol ratio of 0.95 to 1.05 of step (1) of instant claim 5. The reaction between sodium hydrosulfide and sodium hydroxide inherently produces water, therefore, the alkali metal hydrosulfide is present as an aqueous mixture with water as required by instant claim 5. Further, Miyahara et al. teaches that the alkali metal sulfide is generally used in the form of a hydrate or aqueous mixture. Since water is inherent to the dehydration step as taught by Miyahara et al., the limitation that the alkali metal sulfide is present as an aqueous mixture with water is inherently taught by Miyahara et al. Miyahara et al. therefore effectively anticipates the process limitations corresponding to dehydration step (1) of instant claim 5.

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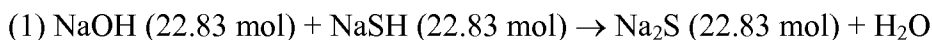
Miyahara et al. further teaches a charging step of adding sodium hydroxide and water to the mixture remaining after the dehydration step such that the mole ratio of water to charged sulfur source is from 0.3 to 5.0 (6:61-65) and the total number of moles of NaOH to charged sulfur source is 1.027. Arrival at the value is shown below:

Example of Miyahara et al. (12:34-51):



Total available "S" is  $(22.54 \text{ mol} - 0.50 \text{ mol}) = 22.39 \text{ mol}$

Since Miyahara et al. teaches that  $\text{Na}_2\text{S}$  can be prepared in situ from sodium hydroxide and sodium hydrosulfide (4:61-64) "in an almost equimolar amount" (6:49-53) Miyahara et al. teaches the following set of reactions when using an equimolar amount of NaOH and NaSH (the number of moles of each component is such that it equals the number of moles of  $\text{Na}_2\text{S}$  starting material used by Miyahara et al. in the application example):



Total available "S" is  $(22.83 \text{ mol} - 0.44 \text{ mol}) = 22.39 \text{ mol}$

Miyahara et al. further teaches that 7.9 g of NaOH (0.198 mol) is then added, providing for 22.57 mol of NaOH  $(22.39 + 0.198)$ . Additionally there are 0.88 mol of NaOH generated by volatilization of  $\text{H}_2\text{S}$ , thus yielding a total of 23.45 mol of NaOH  $(22.57 + 0.88)$ . The mol ratio of NaOH in the reactor/available S is thus  $(23.45/22.83) = 1.027$ , which falls in the claimed mole ratios of instant claim 5. Miyahara et al. therefore effectively anticipates the process limitations corresponding to charging step (2) of instant claim 5.

Miyahara et al. further teaches a first-stage polymerization step of adding a dihalo-aromatic compound to the mixture followed by polymerization at 180 °C to 235 °C to form a prepolymer at a conversion rate of 50-98 mol% (9:23-34). Miyahara et al. therefore effectively anticipates the process limitations corresponding to a first-stage polymerization step (3) of instant claim 5.

Miyahara et al. further teaches a second-stage polymerization step of controlling the amount of water such that there is from 2.0 up to 10 mol of water per mole of charged sulfur source with heating at 245 °C to 290 °C to continue polymerization (9:23-34). Miyahara et al. therefore effectively anticipates the process limitations corresponding to a second-stage polymerization step (4) of instant claim 5. In summary, Miyahara et al. anticipates all of the claimed process steps of instant claim 5.

The melt viscosity of the poly(arylene sulfides) taught by Miyahara et al. all fall within the claimed range of instant claim 5. While Miyahara et al. does not explicitly teach the other physical property limitations of instant claim 5, Miyahara et al. does explicitly teach all of the claimed process steps. Since the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, any physical properties achieved by the compositions of Miyahara and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by

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identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established." See MPEP 2112.01.

Claim 7: Miyahara et al. further teaches during the dehydration step, that the reaction mixture is heated to a temperature of 60 to 280 °C (7:11-24).

Claim 10: Miyahara et al. does not explicitly teach that the prepolymer according to instant claim 5 has a melt viscosity during the first-stage polymerization step of 0.5 to 30 Pa·s. However, the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Miyahara and the instant application would be inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705,709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established." See MPEP 2112.01

Claim 11 : Miyahara et al. further teaches after the second-stage polymerization step, (5) a separation step of separating the polymer from the reaction mixture containing the polymer, and (6) a washing step of washing the polymer thus separated with an organic solvent (9:49-64).

Claim 12: Miyahara et al. further teaches that the separation is achieved by sieving/filtering (9:49-64).

Claim 13: Miyahara et al. further teaches that the organic solvent used in the washing step is acetone (11:21-26).

Claim 3: Miyahara et al. inherently teaches the same process for preparing a poly(arylene sulfide) as applied to claim 5 above. Further, the melt viscosity of the poly(arylene sulfides) taught by Miyahara et al. all fall within the claimed range of instant claim 3. While Miyahara et al. does not explicitly teach the other physical property limitations of instant claim 5, Miyahara et al. does explicitly teach all of the claimed process steps. Since the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, any physical properties achieved by the compositions of Miyahara and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established." See MPEP 2112.01.

### ***Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT LOEWE whose telephone number is (571)270-3298. The examiner can normally be reached on Monday through Friday from 5:30 AM to 3:00 PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. L./

Examiner, Art Unit 1796  
5-May-09

/Randy Gulakowski/

Supervisory Patent Examiner, Art Unit 1796